Experiment 63: Purifying Potassium Chlorate from Matches

For a while, I have wanted to make flash powder, a mixture of potassium chlorate or perchlorate and aluminum powder. Like nitrocellulose, it burns with a flash when unconfined, but it will explode if confined. One easy (if expensive and time-consuming) way to get potassium chlorate is through purification from match heads, so I decided to try the process on a handful of matches. I used this video as a reference for the experiment.

I began the experiment by crushing around 50 match heads into a powder. For cardboard matches, I simply snipped the head off and then pulverized it, but for wooden kitchen matches, I crushed the powder off the match and discarded the matchstick. Once I had a fine powder, I poured in about 100mL of water and stirred to thoroughly dissolve the potassium chlorate.

There were a lot of bits of floating cardboard, so I filtered the mixture through a coffee filter to separate the green-colored solution from the insolubles. I also washed the cardboard with water to recover any soaked-up chlorate solution. Then, I boiled the green liquid down to about 1/10 of its original volume and set the beaker aside to cool. When it had cooled to room temperature, I placed it in an ice bath to precipitate as much chlorate as possible. As the solution cools from boiling to freezing temperatures, the potassium chlorate's solubility drops, so it precipitates as solid crystals.

I filtered off my crystals using another coffee filter and then washed these with acetone to remove some of the green dye; obviously, I didn't get all of it. Potassium chlorate is not soluble in acetone, so this step does not remove any potassium chlorate. Then, I let my crystals dry and weighed them. From around 50 matches, I got 1.5g of fairly pure potassium chlorate. Combined with aluminum powder, this is sure to make a brilliant flash.